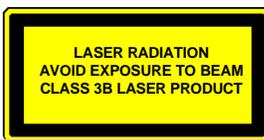


Fiber Optic LAN Components LC SFF Duplex OFE 2.5 Gbps

HFT219x-541

FEATURES

- Prealigned Fixed LC Duplex Optical Front End (OFE)
- VCSEL packaged with a back monitor photodiode
- Common anode and common cathode polarities available
- TO-46 hermetic package for VCSEL and Pin + Preamp
- 3.3 V operation
- GaAs PIN detector and BiCMOS preamplifier
- Differential output for low noise
- High Speed >1GHz
- Laser signal is attenuated



The HFT219x-541 is a single package transmitter and receiver designed to interface with the LC style optical connectors.

The transmitter is a high performance 850nm VCSEL (Vertical Cavity Surface Emitting Laser) packaged for high speed data communications. This product combines all the performance advantages of VCSEL with a custom designed power monitor diode. The power monitor diode can be used with an appropriate feedback control circuitry to set a maximum power level for each VCSEL. Attenuating coatings are available on the Laser transmitter to simplify design and assist in meeting eye safety requirements.

The PIN + preamp converts optical power into a differential output electrical signal. As the light increases, the differential output voltage increases, limiting at input powers above -10dBm. The differential output is designed to be AC coupled into a data amplifier.

The Honeywell HFT219x-541 is designed to interface with 50/125 and 62.5/125µm multimode fiber within an LC style interface.

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VCSEL PARAMETERS

VCSEL Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Peak Fiber Coupled Optical Power (See threshold current and slope efficiency which control power output)	$I_F=7$ mA av. 50/125 μ m fiber NA=0.20	P_{OC}		500		μ W	1
Threshold Current		I_{TH}	1	2	3	mA	
Threshold Current Temperature Variation	$T_A = 0^\circ\text{C}$ to 70°C	ΔI_{TH}	-1.5		1.5	mA	2
Slope Efficiency		η	0.04		0.16	mW/mA	3
Slope Efficiency Temperature Variation	$T_A = 0^\circ\text{C}$ to 70°C	$\Delta\eta/\Delta T$		-6000		PPM/ $^\circ\text{C}$	
Peak Wavelength	$I_F=7$ mA	λ_P	830	850	860	Nm	
λ_P Temp Coefficient	$I_F=7$ mA	$\Delta\lambda_P/\Delta T$		0.06		nm/ $^\circ\text{C}$	
Spectral Bandwidth	$I_F=7$ mA, FWHM	$\Delta\lambda$			0.85	nm	
Laser Forward Voltage	$I_F=7$ mA	V_F		1.8	2.2	V	
Laser Reverse Voltage	$I_R=10$ μ A	BVR_{LD}		-10		V	
Rise and Fall Time	Bias Above Threshold (20%-80%)	t_R t_F			130 150	ps	4
Relative Intensity Noise	1 GHz BW	RIN		-130	-122	dB/Hz	
Series Resistance	$I_F=7$ mA	R_S	22	35	55	Ohms	
Series Resistance Temperature Coefficient	$I_F=7$ mA, 0°C to 70°C	dR_S/dT		-3000		PPM/ $^\circ\text{C}$	

Photodiode Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Monitor Current	$P_{OC}=0.5$ mW	I_{PD}		0.35		mA	
Monitor Current Temperature Variation	$P_{OC}=0.5$ mW	$\Delta I_{PD}/\Delta T$		0.2		%/ $^\circ\text{C}$	
Dark Current	$P_O=0$ mW, $V_R=3$ V	I_D			20	nA	
PD Reverse Voltage	$P_O=0$ mW, $I_R=10$ μ A	BVR_{PD}	30	115		V	5
PD Capacitance	$V_R=0$ V, Freq=1 MHz $V_R=3$ V, Freq=1 MHz	C		75 40	100 55	pF	

Notes:

1. Operating power is set by the peak operating current $I_{PEAK}=I_{BIAS}+I_{MODULATION}$.
2. Operation at temperatures outside the specified range may result in the threshold current exceeding the maximums defined in the electro-optical characteristics table.
3. Slope efficiency is defined as $\Delta P_O/\Delta I_F$ at a total power output of 0.5 mW. Slope efficiency is intentionally lowered to the values shown by optical attenuation.
4. Rise and fall times are sensitive to drive electronics.
5. To safeguard the VCSEL from current spike damage, short the VCSEL anode and cathode to each other during photodiode BVR verification testing.

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RECEIVER PARAMETERS

ELECTRO-OPTICAL CHARACTERISTICS ($V_{cc}=3.3V$, AC coupled to 50Ω , $0^{\circ}C < T < 70^{\circ}C$ unless otherwise specified)

Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Electrical Characteristics							
Supply Voltage	$P_{in} = 0\mu W$, $R_{load}=50\Omega$	V_{cc}	3.0	3.3	3.6	Volts	1
Supply Current	$P_{in} = 0\mu W$, $R_{load}=50\Omega$	I_{cc}		26	40	mA	1
Output Offset Voltage	$P_{in} = 0\mu W$, $R_{load}=50\Omega$	V_{offset}	-100		100	mV	9,10
Output Resistance	Single ended, freq = 0Hz	R_o	40	50	62	Ω	
Opto-Electronic Characteristics							
Responsivity	$P_{in} < AGC_{th}$, $R_{load}=50\Omega$	R		1400		$\mu V/\mu W$	2,3,10
Differential Output Voltage	$P_{in} = 200\mu W$, $R_{load}=50\Omega$, $V_{offset} = 0$ mV	V_{out}	90	160	400	mV	1
Upper 3dB Bandwidth		BW_{upper}	1700	1900	2500	MHz	4
RMS Output Referred Noise	$P_{in}=0\mu W$, $R_{load}=50\Omega$ 1875 MHz BT Filter			1.5	2.25	mV	5
Sensitivity	$BER=10^{-12}$, $SNR=7$	S	-17	-20		dBm	
Power Supply Rejection Ratio	$P_{in}=0\mu W$, $R_{load}=50\Omega$	PSRR	10	30		dB	6
Pulse Width Distortion	$P_{in}=20\mu W$ peak, $R_{load}=50\Omega$	PWD			40	ps	7
Rise/Fall Time	$P_{in}=20\mu W$ peak, $R_{load}=50\Omega$	T_R/T_F			250	ps	8
Wavelength Responsivity	$P_{in}=20\mu W$ peak, $R_{load}=50\Omega$	λ	760	850	860	nm	
AGC _{th} threshold power	$V_{offset} = 0$ mV, $P_{in} =$ Peak power	AGC _{th}		60		μW	9,10

Notes:

1. Pin refers to the peak optical power at the face of the fiber optic cable input to the HFD3180-102.
2. Responsivity measured with source wavelength of 850nm, freq = 0Hz, $P_{in} < AGC_{th}$, $R_{load}=50\Omega$, sample tested at 2.5Gbps
3. The output voltage increases as received light power increases, up to approximately -15dBm depending upon the AGC_{th}. The preamplifier is designed to limit the electrical output signal above this optical input level, and does not introduce signal distortion until the average input power exceeds 0dBm.
4. Bandwidth is measured with a small signal sinusoidal light source with 50 μW average power, $R_{load}=50\Omega$.
5. RMS input referred optical noise is sample tested by measuring the RMS output referred noise, then dividing by the responsivity.
6. PSRR is sample tested from 300KHz to 1GHz by injecting a -20dB electrical signal on the V_{cc} pin. The nominal value at 100MHz is recorded. No external bypass components are assumed. An external V_{cc} filter network will greatly increase the PSRR.
7. Sample tested at the 50% level of output pulses.
8. Rise and fall times are sample tested with source wavelength of 850nm, 125MHz square wave, with optical rise and fall times < 200ps, $P_{in} < AGC_{th}$, $R_{load}=50\Omega$. Measured at 20% - 80% signal levels
9. Output offset voltage is defined as $V_{out} - V_{outQ}$ with no light
10. The AGC_{th} power depends on the offset voltage. Refer to fig 3.

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Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-40 to +85°C
Operating Temperature	0 to +70°C
Lead Solder Temperature	260°C, 10 sec.
Continuous Optical Output Power (Any Current)	5 mW
Laser Diode Reverse Voltage ($I_R=10 \mu A$)	5 V
Laser Continuous Forward Current, Heat-Sinked	12 mA
PIN Photodiode Forward Current	10 mA
Power Supply Voltage (PIN + Preamp)	3.8 V
Incident Optical Power	0 dBm average, +4 dBm peak

NOTICE

Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operations section for extended periods of time may affect reliability.

NOTICE

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation to equipment, take normal ESD precautions when handling this product

ORDER GUIDE

Catalog Listing	Description
HFT2190-541	Attenuated, Common Anode
HFT2191-541	Attenuated, Common Cathode

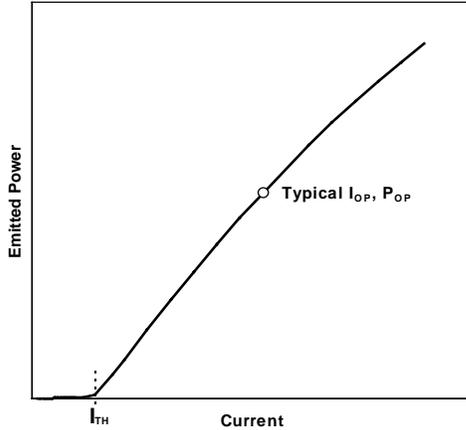
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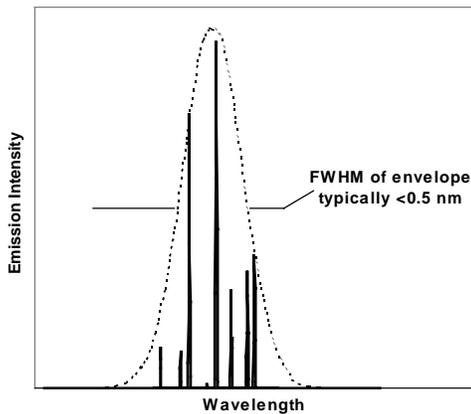
HFT219x-541

TYPICAL PERFORMANCE CURVES

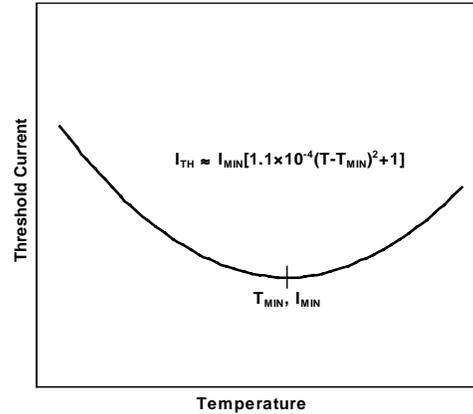
Emitted Power vs. Current: Power varies approximately linearly with current above threshold.



Emission Intensity vs. Wavelength: Typical 10 mA spectrum comprises multiple lines corresponding to multiple transverse modes.



Threshold Current vs. Temperature: Threshold current varies parabolically with temperature; thus it can be nearly constant for a limited temperature range.



NOTICE

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation to equipment, take normal ESD precautions when handling this product.

DANGER

The VCSEL is a class IIIb laser and should be treated as a potential eye hazard. Due to the size of the component, the applicable warning logotype, aperture label, and certification/identification label cannot be placed on the component itself. These labels can be found on the individual envelope in which the VCSEL unit is packaged, or attached to the shipping package.

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FIGURE 1: INTERNAL SCHEMATIC DIAGRAM OF THE HFD3180-102

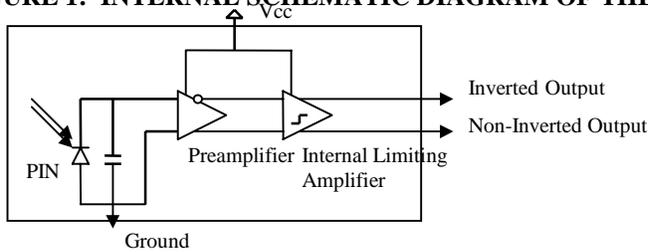


FIGURE 2: RECOMMENDED INTERFACE CIRCUIT FOR THE HFD3180-102

$R=10\ \Omega$

$C_1 = 10\ \text{nF}$

$C_2 = \text{Data rate dependant (22nF for rates } > 1\text{Gbps)}$

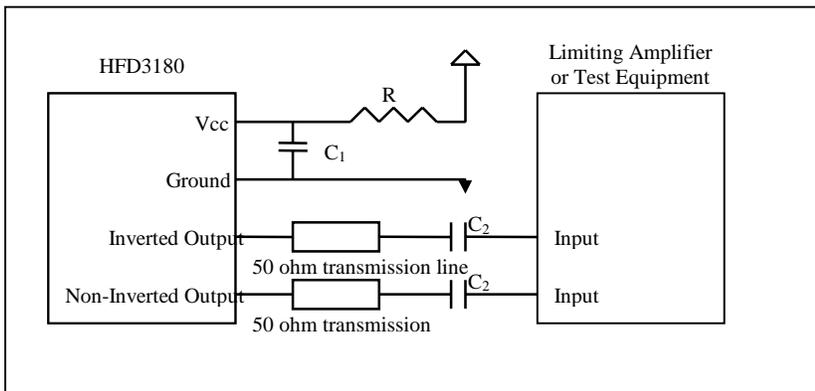


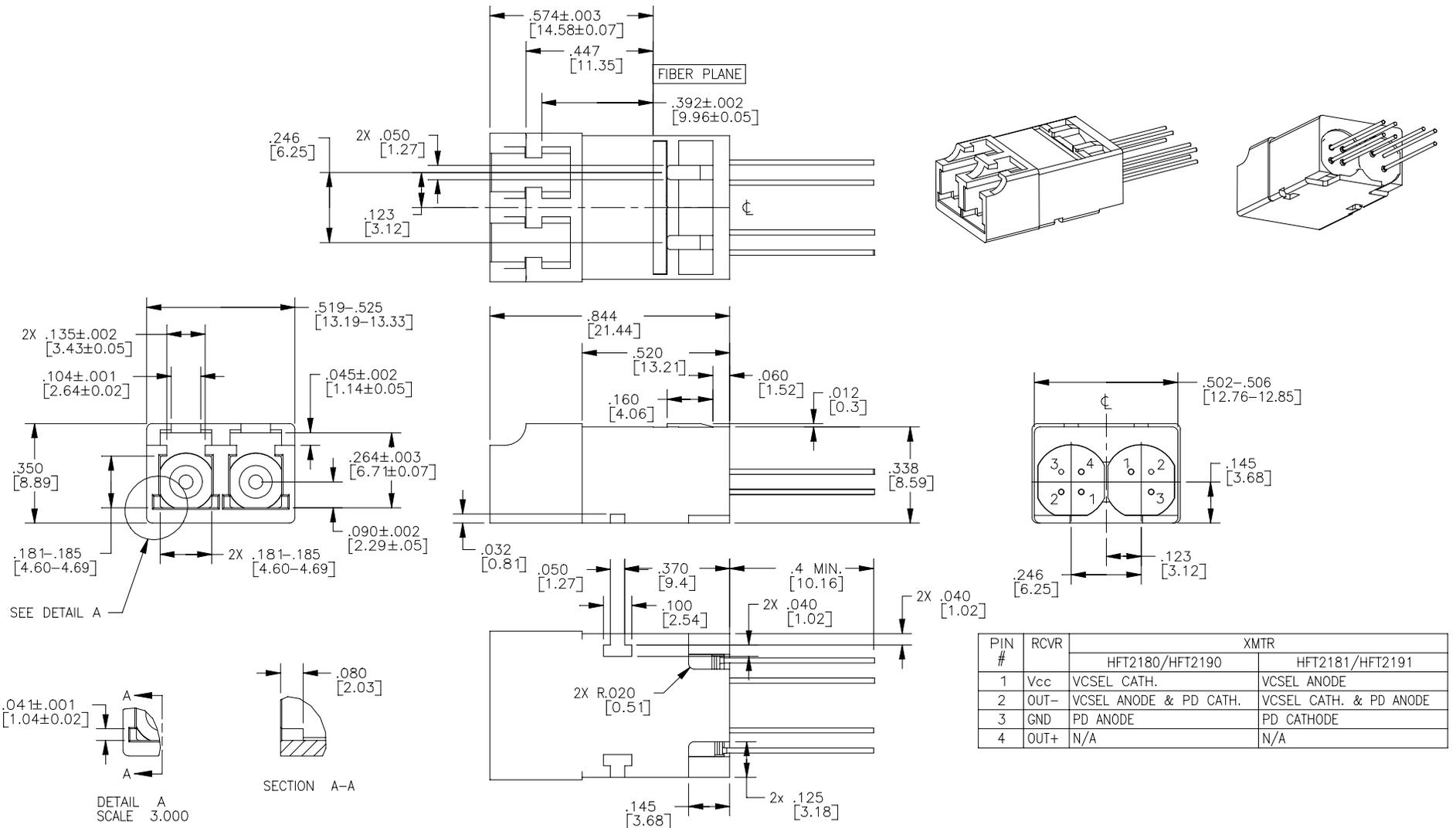
FIGURE 3: AGC THRESHOLD POWER VS. OUTPUT OFFSET VOLTAGE



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Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Commencing with the date of shipment, Honeywell's warranty runs for 18 months. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

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TELEPHONE

1-800-367-6786 (USA)
1-800-737-3360 (Canada)
+49 (0) 89 35813310 (Germany)
+65-580-3312 (Singapore)
+44 (0) 118 981 9511 (UK)

INTERNET

<http://www.honeywell.com/VCSEL>
VCSEL@honeywell.com

FAX

1-972-470-4326 (Customer Response Center)
1-972-470-4549 (Fax on demand)
+49 (0) 89 3599971 (Germany)
+65 445 3033 (Singapore)
+44 (0) 118 981 7513 (UK)

01/29/02

Honeywell

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



Printed with Soy Ink
on 50% Recycled Paper

PK XXXX X DMM Printed in USA



Honeywell Inc.
Optoelectronics Facility
830 East Arapaho Road
Richardson, Texas 75081

**Honeywell Control
Systems Ltd.**
Zodiac House
Calleva Park
Aldermaston, Berkshire
RG7 8HW England

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